

**CONTROL DEVICE AND MOUTHPIECE**

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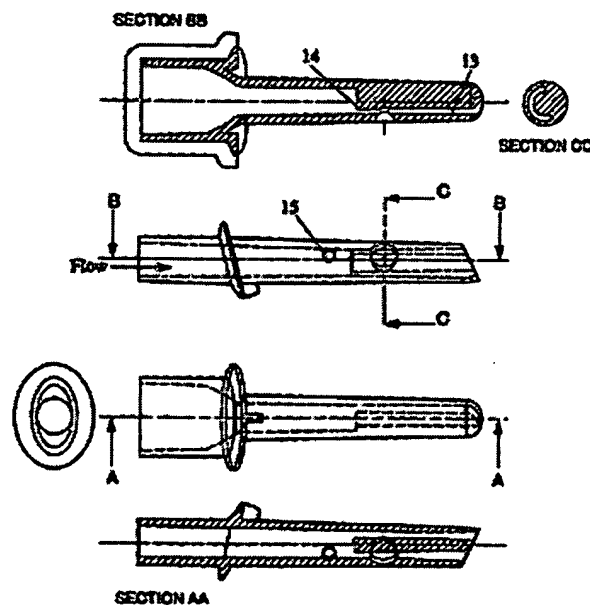
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**Abstract of WO9526889**

A control device, such as a breathalyser, has an interlock which acts to control access to/or use of an apparatus, like a vehicle, by a person under the influence of alcohol. The device is provided with a means for determining whether the interlock has been bypassed by monitoring the line voltage of the vehicle and determining with reference to a perceived condition, such as ignition status, whether the voltage level monitored is correct. A mouthpiece of the breathalyser has a relatively straight through design so that condensate internal of the mouthpiece gravitates to the bottom of the mouthpiece and is expelled out by the passage of air. The mouthpiece has a channel (13) in one end creating a venturi effect and thereby developing laminar flow. The interlock has a detachable memory module which provides for easier downloading of recorded information and also provides a mechanism by which the operating program of the interlock can be updated.



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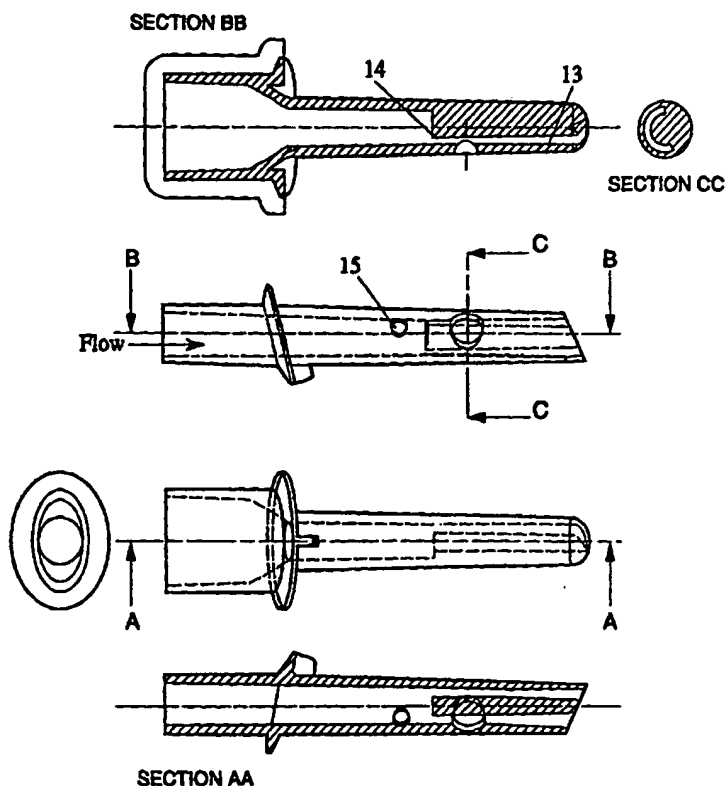
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(54) Title: CONTROL DEVICE AND MOUTHPIECE

(57) Abstract

A control device, such as a breathalyzer, has an interlock which acts to control access to/or use of an apparatus, like a vehicle, by a person under the influence of alcohol. The device is provided with a means for determining whether the interlock has been bypassed by monitoring the line voltage of the vehicle and determining with reference to a perceived condition, such as ignition status, whether the voltage level monitored is correct. A mouthpiece of the breathalyzer has a relatively straight through design so that condensate internal of the mouthpiece gravitates to the bottom of the mouthpiece and is expelled out by the passage of air. The mouthpiece has a channel (13) in one end creating a venturi effect and thereby developing laminar flow. The interlock has a detachable memory module which provides for easier downloading of recorded information and also provides a mechanism by which the operating program of the interlock can be updated.



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**CONTROL DEVICE AND MOUTHPIECE****FIELD OF INVENTION**

The present invention relates to a control device (and parts therefore), which device acts to control access to or use of an apparatus by a person under  
5 the influence of a drug.

In one form, the device of the present invention has application to a vehicle and serves as a device to control access or use of the vehicle by a person.

More specifically, the present invention, in one embodiment, can be used  
10 as a device to control the ignition system of a motor vehicle and serve to inhibit use of the vehicle by person under the influence of a drug such as alcohol.

A number of aspects of the present invention are separately disclosed in this document, such as apparatus (or vehicle) status monitoring, mouthpiece assembly, compliance recording, programability.

**15 BACKGROUND ART**

In the prior art there are a number of alcohol measuring devices which inhibit the operation of a vehicle by an intoxicated person. The prior art generally deals with tampering or bypassing the measuring activity of the device, by identifying whether the person being measured is in fact the normal  
20 driver of the vehicle. Operation of the vehicle is inhibited for those persons who are not the normal driver of the vehicle. An example of such prior art is AUA10970/88, AUB784112/87, US4809810, US4678057, and US5224566.

Further prior art discloses methods and apparatus for determining or correcting the accuracy of a reading given by prior art measuring devices, by  
25 way of correcting for air temperature, heating of fuel or measuring cells and whether the measuring device accurately records events as they occur. For example AUB26915/88, AUA21638/92, AUB23984/84 and US4901058.

The prior art, nonetheless, still has problems associated with unsupervised operation, particularly in relation to features of user friendliness,  
30 service and adaptability, and reliability.

**OBJECT OF INVENTION**

The present invention, in one or more forms, has as its object to alleviate at least one problem associated with the prior art.

**SUMMARY OF INVENTION**

- 5        In general terms, the present control device enables, disables, and/or controls the operation of some other apparatus, such as a motor vehicle. The control device has application to other areas of industry and technology where human operation is involved and the present invention is equally applicable to these other areas. In one form, the control device is an interlock.
- 10        The control device of the present invention, in one form, is adapted to serve many users and markets. One such market is a legislative market, in which the user is forced to use the present control device as a result of a Court judgement, for example as the result of a drink driving conviction. The Court may impose the use of the control device of the present invention in an attempt
- 15        to avoid a recurrence of the drink driving offence. Another market is a voluntary market, which is essentially a user defined or after market. The user defined market may encompass the installation and use of the control device of the present invention in a vehicle used for private purposes in order to avoid the operation of the vehicle by a driver while under the influence of a drug. In
- 20        another application, the present invention may be used in fleet or corporate vehicles in order to reduce the ability of persons to operate or control company apparatus, such as vehicles or equipment, when under the influence of a drug. Such legislative, user and after markets are predominantly, but not exclusively, found in the use and the control of the use of motor vehicles.
- 25        The present invention may also be used in conjunction with machinery, in controlling or assessing whether a human operator is in a condition considered suitable to operate the machinery.

The present disclosure outlines separately what are considered to be a number of inventive aspects of the present invention.

30        **STATUS MONITORING**

This aspect provides a method and / or device by which the status of the vehicle can be determined and / or recorded. This aspect is predicated on the

realisation that by-pass monitoring can be accomplished by monitoring and/or recording the level of vehicle voltage supply in conjunction with other available indications or data such as ignition status.

This aspect provides a method or means of determining a bypass event,  
5 including monitoring means for monitoring apparatus voltage level and logic means for determining, preferably with reference to other data such as ignition status, whether the voltage monitored accords with the other data.

Preferably, memory means is also provided for recordal of a bypass event.

10 It has been found that, where a person who wishes to drive a vehicle without passing the test conducted by the control device of the present invention, that person may simply seek to "hot-wire" the vehicle ignition or disable or deactivate the control function provided by the device of the present invention. This would effectively by-pass the control of the vehicle exhibited by  
15 the device of the present invention and would be considered undesirable. Such an event can be monitored, and subsequently recorded for scrutiny by authorities, by the measurement and recording, if necessary, of the voltage supply level of the vehicle, time, date and/or other relevant data.

This aspect of the present invention may:

- 20 a) determine correct usage of the control device, and / or  
b) determine correct operation of the control device.

For example:

- i) Is the vehicle being started without the presentation of a breath  
sample?  
25 ii) Is the vehicle failing to start on presentation of a valid breath  
sample?

This information may be important evidence in supporting or instigating any legal proceedings.

In addition to the engine condition and the battery condition, other  
30 vehicle data, such as speed, may also provide valuable pieces of additional information, which enables further analysis of operational events, which can be monitored and/or recorded by a control device of the present invention.

**MOUTHPIECE ASSEMBLY****FLOW THROUGH**

This aspect provides a mouthpiece having a relatively straight through design for the passage of fluid there through configured to enable moisture deposited internal of the mouthpiece to substantially clear by passage of the fluid through the mouthpiece. This aspect is predicated on the realisation that a mouthpiece can be designed so as to utilise the force of gravity in dealing with the problem of accumulated residue or moisture internal of the mouthpiece. This aspect involves the concept of providing, designing and / or developing a mouthpiece suitable for a control device, including but not being limited to the control device disclosed above, such that the mouthpiece would clear or substantially reduce any condensing moisture by way of the air flow through the device to the outside of the device.

It is desirable that as a result, accumulation of residue or moisture would become externally conspicuous and would not accumulate unseen internal to the device to create a health or accuracy problem(s) if the mouthpiece was not changed as recommended.

In one form, the present invention provides the feature noted above by removing the moisture by way of gravity to substantially the bottom of the tube, and preferably expel that moisture from the end of the mouthpiece by the passage of air through the mouthpiece.

In addition, the mouthpiece of the present invention is preferably configured in its use in connection with the control device such that the sample and pressure port apertures are placed relatively far away from the natural drainage path of the mouthpiece. Thus, it is considered desirable, but not essential, to include the apertures on or toward the high side of the tube, away from the normal drain path for the moisture. Apparatus on the side of the tube is also suitable.

In a further aspect, a mouthpiece having a design that enables or facilitates visual inspection would also be considered advantageous. If there is any accumulation of condensation or other material within the mouthpiece, it would be unsightly and obvious to the user.

The flow through and self-clearing nature of the mouthpiece feature of the present invention also serves to meet yet a further requirement of the market. That is, that pathogenic material should not be sucked, or should be difficult to, suck back through the mouthpiece. The present mouthpiece  
5 facilitates this desirable aspect by way of a relatively low flow through resistance to ambient air and substantially without accumulation sites.

#### LAMINAR FLOW

A second aspect relating to the mouthpiece is predicated on the provision of laminar air flow through the mouthpiece to provide a substantially  
10 turbulent free sampling area. Preferably, an improved 'venturi' effect is also provided within the mouthpiece. It has been found that the second aspect provides an improved method and mouthpiece for sample analysis by a control device.

#### COMPLIANCE RECORDING AND ADAPTABILITY

15 The feature of Compliance Recording is directed at the monitoring and / or recording of events monitored by the control device of the present invention.

It has been found difficult in prior art arrangements to report events monitored by the control device to a responsible authority, whether the authority is a corporate entity, legislative body, or other applicable reporting or recording  
20 entity. Prior art arrangements require a person to service the device on site, or have the device returned to a central station for reading by the authority.

This aspect of the present invention is predicated on the understanding that a control device can have a detachable means for storage of event recordings, and that the detachable storage means can be interchanged with a  
25 fresh memory module. The present aspect is considered to overcome the drawbacks of the prior art by the provision of a detachable memory module of suitable form.

The feature of Adaptability is directed to the provision of a means by which each control device can be relatively easily modified and / or updated to  
30 accommodate changes in Law, practice or policy in relation to the operation of the device or an apparatus which they control.



Surprisingly, it has been found that adaptability may also be provided in a control device by the use of a detachable storage means.

Preferred embodiments of the present invention will now be disclosed with reference to the accompanying drawings, in which:

- 5        Figure 1 shows a flow chart of the operation of the control device;  
       Figure 2 illustrates one form of vehicle status monitoring;  
       Figure 3 illustrates in block diagram form, one embodiment of circuitry for vehicle status monitoring;  
       Figure 4 illustrates one form of mouthpiece; and  
10       Figure 5 illustrates another form of mouthpiece.

#### **INTERLOCK BASIC OPERATION**

Before detailing the various aspects of the present invention, it is worthwhile to outline the overall operation of the control device, and thereby better appreciate the various aspects to be more fully described later.

15 Therefore, with reference to Figure 1:

1.    **POWER UP/RESET**

Device is switched on or an internal reset occurs

2.    **PARAMETRIC SETUP & CHECKS**

20       Device parameters are loaded and internal checks are performed,  
       for example calibration factors, device options are loaded. Device integrity or EEPROM and RAM may be checked for errors.

3.    **MODE OF OPERATION**

The device as a whole has a series of operational modes when the device is turned on.

25       These are:

a)    **Normal Mode** - user/vehicle mode

b)    **New Memory Module Detected** - Detects insertion of a new memory module and automatically sets the device into calibration mode.

30       c)    **Service Mode** - Device service mode where various checks and options can be manually set/reset as well as internal componentry monitoring.

- d) **Factory Initialisation** - Upon first time power up, device automatically enters factory initialisation whereby all device functions are checked and all options are set.
- 5 e) **Serial Download** - if the memory module is connected to an Interlock Download Module (automatic detection), memory module functions can be performed such as downloading all data acquired, clearing data acquisition area, resetting clock and checking the battery level.
- 10 f) **Self test Mode** - Initiated with a double turn of the vehicle ignition switch. Performs automatic checks on all internal components of the device.

#### 4. OPERATION IN NORMAL MODE

When the device is installed into a vehicle or onto a machine, it is intended for the device to be used in the normal mode. The normal mode of operation is presumed to be one in which the vehicle's access or operation can be enabled, disabled or controlled through the application of a breath sample into the device.

15 In the normal mode the vehicle's ignition switch is used to access the device (wake the device up by turning the key to the ignition position). With reference to Figure 1, once 'woken up', the device enters the warmup phase in which the fuel cell is heated to its nominal operating temperature. During the wait phase, "WAIT" is displayed for user acknowledgment.

20 On completion of the wait phase, the device enters the blow phase in which a breath sample is requested. 'PLEASE BLOW' is scrolled across the display to indicate to the user that a breath sample is required. During the presentation of the breath sample, the flow is monitored until a sufficient volume of the user's breath has been presented from which a small proportion is drawn into the fuel cell for the detection of any presence of a drug such as alcohol. The resultant concentration of alcohol located in the user's breath (BrAC) is then calculated displayed and recorded into memory.

25

30

Depending upon whether or not the result is within acceptable limits, the vehicle's ignition system is enabled or disabled.

If the result is lower or equal to the allowable limit the vehicle can be accessed and a restart timer is started allowing the user to a time limit  
5 for which the vehicle can be started without another test.

If the result is higher or equal to the allowable limit, the vehicle cannot be accessed and a retest timer is started inhibiting the use of the vehicle and the device for a predetermined length of time. Once this time has passed, another test can be performed.

10 The vehicle's engine is preferably constantly monitored throughout all process/phases in the normal mode of operation with power permanently applied to the control device.

#### STATUS MONITORING DISCLOSURE

In accordance with one form of the status monitoring aspect of the  
15 present invention, each of these four conditional states:

- (1) Battery condition
- (2) Engine running
- (3) Engine off
- (4) Engine cranking

20 may be determined by looking at the presence, absence or level of electrical output from different locations. However, they may be deduced intelligently by observing the electrical level on only one line with respect to the vehicle conductive body (ie, zero volt reference or ground).

When the engine is off, the vehicle battery is not being charged and  
25 usually has very little load or battery drain. Therefore, measuring the battery voltage would indicate the battery condition.

When the engine is running the battery is under charge and the battery voltage is normally higher than the normal pseudo open circuit voltage (engine off condition). When the engine is cranking, the battery is under maximum load  
30 because the starter motor consumes a relatively large amount of electrical power in a given time interval. As a result, the battery voltage falls below that of the normal "engine off" voltage.

By measuring the electrical potential of the vehicle battery with respect to the normal "engine off" voltage, the engine condition (i.e. cranking) followed by the engine running (due to a relatively higher voltage monitored) may be deduced.

5 It is important to establish a set of relative threshold ranges, as illustrated in Figure 2, for assuming the three conditional states of the engine:

- a) Engine off (1)
- b) Engine cranking (2)
- c) Engine running (3)

10 in order to enable the determination of vehicle status, including engine status, and whether the control device of the present invention has or has not been bypassed.

Each of threshold levels (2) and (3) is relative to the value of (1). Condition (1) can therefore be monitored so that threshold values of (2) and (3)  
15 may be either continually or periodically revised and / or determined.

Other signals superimposed on the 'dc' level of the line can assist in the determination of engine condition (ie, alternator charging frequencies) and these too may be monitored by way of a demodulation or noise threshold circuit. Also, other available inputs may assist in analysing or confirming the  
20 determined status, e.g. ignition input, door opening, tachometer signal, etc.

An important feature of being able to monitor engine condition on a single line is that it reduces the number of wires (or cables) required to be connected during installation of the control device of the present invention. This reduces the chances of an installation error, the cost of installation, and the cost  
25 of the device. It also increases the mechanical reliability of the device.

Since the voltage supply line being monitored is from the battery and this line (including a zero volt reference line) must already be connected to provide power to the device, there are in fact no additional lines that are required to determine this important data, in accordance with one embodiment of the  
30 present invention.

The engine condition circuitry of Figure 3 monitors the vehicle battery voltage level. The voltage level monitored 17 is converted to digital form as it is

a convenient form for logic processing. The digital conversion is performed by an analogue-to-digital converter 18, for processing by the processing circuitry. The processing circuitry 19 determines, in conjunction with other data or indications, such as ignition actuation, whether or not by-pass is occurring. For  
5 example, if the processing circuitry determines that the battery voltage is at the 'cranking' level, and the ignition status is "off", it is assumed that a by-pass event is occurring. In such an event, the date, time, and other relevant data is recorded in the memory 20 of the control device.

#### MOUTHPIECE DISCLOSURE

#### 10 FLOW THROUGH DESIGN

Referring to Figure 4, the mouthpiece 4 is configured in a way that it is inherently self clearing with respect to moisture from the breath that normally condenses on the internal surface of a mouthpiece. With this design the condensate runs by gravity to the bottom of the tube 5. As the breath is blown  
15 through (arrow), this takes the condensate through the mouthpiece to escape out at the end 6.

The mouthpiece has a 'keyway' 7 to ensure insertion at the correct rotation.

The sample 9 and pressure port 10 apertures are preferably placed on  
20 the higher side of the tube, away from the normal drain path for the condensate.

The mouthpiece also incorporates a breath flow restrictor 8 to "amplify" pressure changes and improve the accuracy of breath volume calculations. This restrictor is so designed as not to impede the drainage flow of the condensate. The restrictor also provides a mechanism to assist the condensate  
25 to gravitate into the breath flow path.

When utilising pressure sensing of the breath sample it improves the measurability of the pressure if resistance to flow creates a differential back pressure. The differential pressure is relative to the normal ambient air pressure. A flow restricting aperture in the mouthpiece has the potential to  
30 improve the ability to measure a breath pressure signal, but reduce the self clearing ability of an unobstructed tube. Thus, the back pressure created or allowed for in the design of the mouthpiece needs to be balanced against the

sensitivity of the pressure sensor and the ability for a user to deliver sample relatively easily. The flow restriction aperture 11 is preferably placed in the natural drainage path of the moisture, i.e. on the lower side of the tube. The shape of the aperture preferably allows for surface effects of the condensed moisture and should tend to maximise the natural drainage under relatively minimal or substantially zero flow conditions.

The sample of breath is extracted from the mouthpiece on the ambient pressure side of the restrictor. The extraction (sample) port 9 is designed so that the flow of air through the restrictor creates a slight pressure reduction (by virtue of a 'venturi' effect at the port aperture and thus through the sample system.

At the distal end of the mouthpiece a "crown" shaping arrangement 12 may be provided to prevent simple blockage of the mouthpiece, which might result in an incorrect flow / volume. In the same manner, an internal leakage path between the affixed mouthpiece holder and its constraints substantially prevents a static pressure being created within the mouthpiece holder when a mouthpiece has not been inserted.

It is preferred for the internal and external walls of the mouthpiece to be tapered to allow relative sealing and for moulding tool separation.

Back pressure is substantially created by the pressure restricting aperture provided in the internal wall partition.

Preferably, the back pressure can be determined or created as low as is permissible for a reliable and accurate measurement by a sensor.

"Deep lung" air is considered to be a physiological requirement of alcohol measurement on the breath. It is thus necessary to expire a predetermined volume of air from the user before a sample for measurement purposes can be taken. Lung capacity varies significantly from one user to another, but the "dead space" (i.e. volume of air in the mouth, tubes, etc) is considered to be constrained to an upper limit. Therefore, a control device, in use, allows a predetermined volume of air to pass through the mouthpiece

before a sample is taken for measurement purposes. A volume of approximately one litre may be considered a minimum before a suitable sample can be taken.

The material chosen for the mouthpiece (for example, food grade  
5 Polypropylene, polyethylene, PET) should have the following desirable properties:

- (1) Not brittle and with "soft" edges
- (2) Durable and strong
- (3) Clear/translucent material enables viewing of internal  
10 contamination
- (4) Low cost for disposability

The mouthpiece is keyed to the mouthpiece holder to enable correct sample and pressure port alignment. The holder is usually provided on the control device in a permanently fixed position and therefore determines the  
15 fixed orientation of the mouthpiece.

The holder design contributes in part to the conditions required for sample extraction. The contribution is providing a seal at the sample and pressure ports and providing access support and alignment for the sample and pressure tubes.

## 20 LAMINAR FLOW DESIGN

In accordance with the second aspect outlined above and with reference to Figure 5, a laminar flow is created in the present mouthpiece by the provision of a substantially constant diameter channel 13 from which the sample is extracted for analysis.

25 In the present application, the words laminar flow are used to indicate a state of reduced or negligible turbulent flow of material.

Figure 5 illustrates one embodiment of the second aspect of the present invention.

The changes to the mouthpiece described above have been designed to  
30 create a laminar flow in the channel from which the sample is extracted. In the design disclosed above, the mouthpiece is internally divided into two. The separation is caused by an internal wall 14 with an aperture 15 designed to

provide back pressure on the source side of the air flow. The positive back pressure can then be measured to indicate air flow in the mouthpiece. The sample is required to be taken from a volume at ambient or slightly negative pressure to ensure that the air flow in the mouthpiece does not flow to the  
5 sensor because of a leakage path or pressure change.

In this second aspect, the aperture is designed to create back pressure and has been extended to the end of the mouthpiece thus creating a channel 13 rather than a chamber (15 Figure 4) from which the sample is extracted. This approach has been found to result in a more constant pressure at the  
10 sample point due to the "venturi" effect created by the channel or narrowed section. It has also substantially eliminated most turbulent mixing as there are substantially no "dead spaces" within the channel. This improvement results in a more stable sample analysis.

#### COMPLIANCE RECORDING

15 In the event that the detachable module becomes full, or preferably on a regular or timely basis, the authority can forward a fresh or blank memory module to the person using the control device of the present invention, who in turn can replace the module currently in the device with the fresh module. Alternatively, authorised service personnel may replace the full module with a  
20 fresh or blank module. The used module can then be forwarded to the authority, for example by post or courier, and upon receipt, the authority can down load the data in the module and enter that down loaded information against a history of the particular person, corporation or vehicle.

The detachable nature of the module of this feature enables the  
25 accumulated data to be more readily collected for inclusion in a central database without the necessity of specialised local equipment or relatively highly skilled personnel. Because the data itself cannot be accessed, or is configured to inhibit access, by unwanted intermediary participants in the collection process, data integrity is considered to be more reliable and  
30 collection agencies are considered to be protected against accusations of data manipulation and/or corruption.



**ADAPTABILITY**

This feature provides a unique ability, compared to the prior art, by way of having the, or a substantial part of the, operating program of the control device provided on a detachable module, which may be the data memory  
5 module. In this way, and preferably together with the feature noted above, when there is a necessity to update or change the operation of the control device, the operating program can be amended or changed in the memory when the data memory is routinely returned to the responsible authority. Again, a courier or postal service may be considered an appropriate mechanism to  
10 return the detachable memory modules, depending on the security level associated with the control device. Also, if a user wishes to update the operation of the control device on a voluntary basis, a fresh module can be provided without the need to recall the device or reinstall a new and updated device. The "old" module can then be returned to a central point for re-use, if  
15 required.

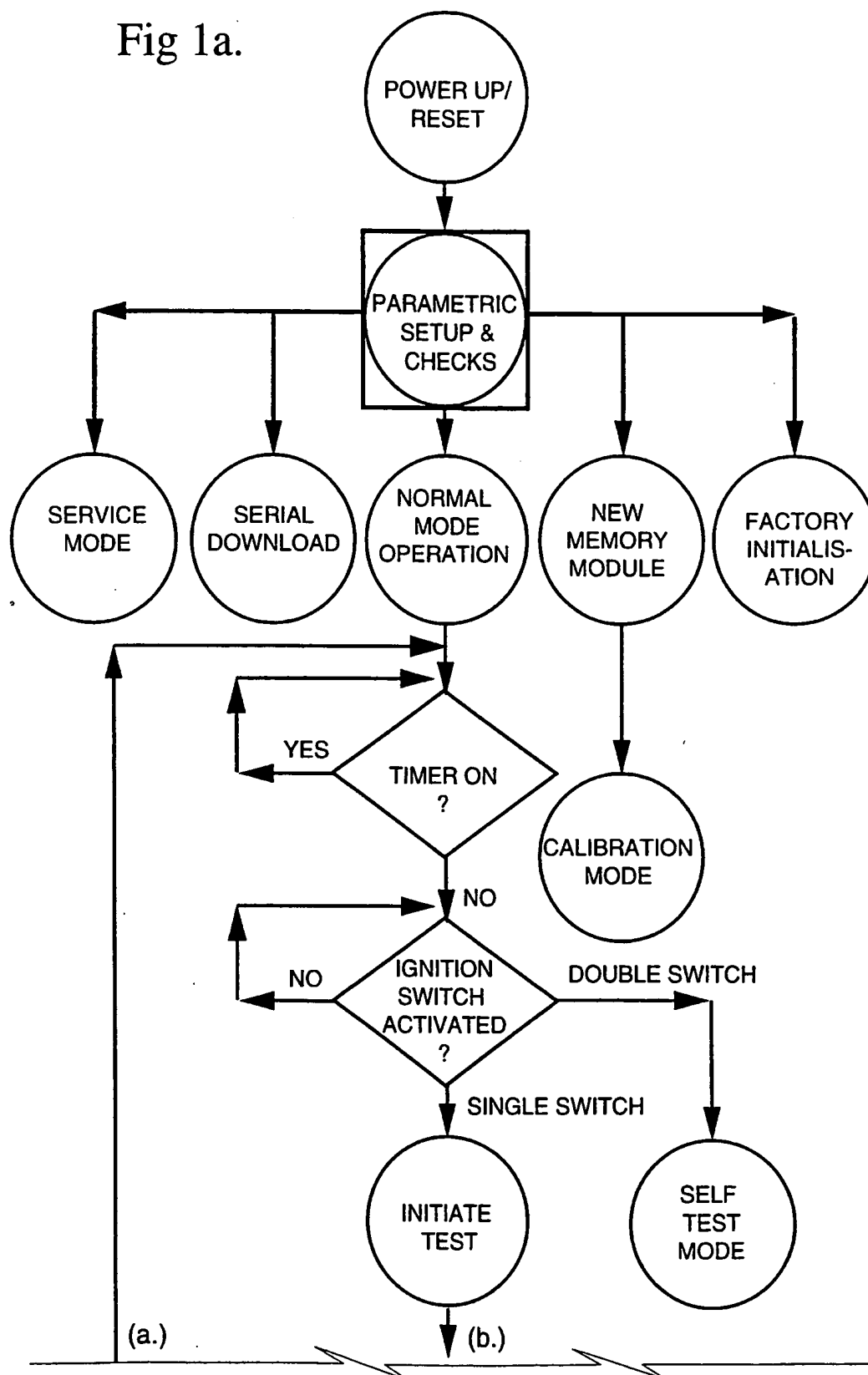
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of determining whether a control device coupled to an apparatus has or has not been by-passed, the method comprising:
  - monitoring the voltage level applied to the apparatus;
  - determining with reference to a perceived condition of the apparatus whether the voltage level monitored is correct; and
  - determining that the control device has been by-passed if the perceived condition is not correct.
2. A device for determining whether a bypass event has occurred to a control device such as an interlock, comprising:
  - monitoring means adapted to monitor supply voltage; and
  - logic means adapted to determine, with reference to other data, such as ignition status, whether the voltage monitored accords with the other data.
3. A device adapted to carry out the method as claimed in claim 1 or 2.
4. A mouthpiece having a relatively straight through design for the passage of fluid therethrough configured to enable moisture deposited internal of the mouthpiece to substantially clear by passage of the fluid through the mouthpiece.
5. A mouthpiece as claimed in claim 4, where the deposited moisture flows by gravity into the fluid flow path.
6. A mouthpiece as claimed in claim 4 or 5, wherein a pressure restricting aperture is provided internal of the mouthpiece and which is adapted to create back pressure.
7. A mouthpiece comprising a channel configured to develop in use a laminar fluid flow therethrough.

8. A mouthpiece as claimed in claim 7, where the channel provides 'venturi' effect.
9. A mouthpiece as herein disclosed.
10. A control device such as an interlock adapted to control the operation of an apparatus, comprising a detachable module.
11. A device as claimed in claim 10, wherein the module includes a memory for recording events monitored or data determined by the device.
12. A device as claimed in claim 10 or 11, wherein the module is adapted to store an operating program used by the device.
13. A device, apparatus or module as herein disclosed.

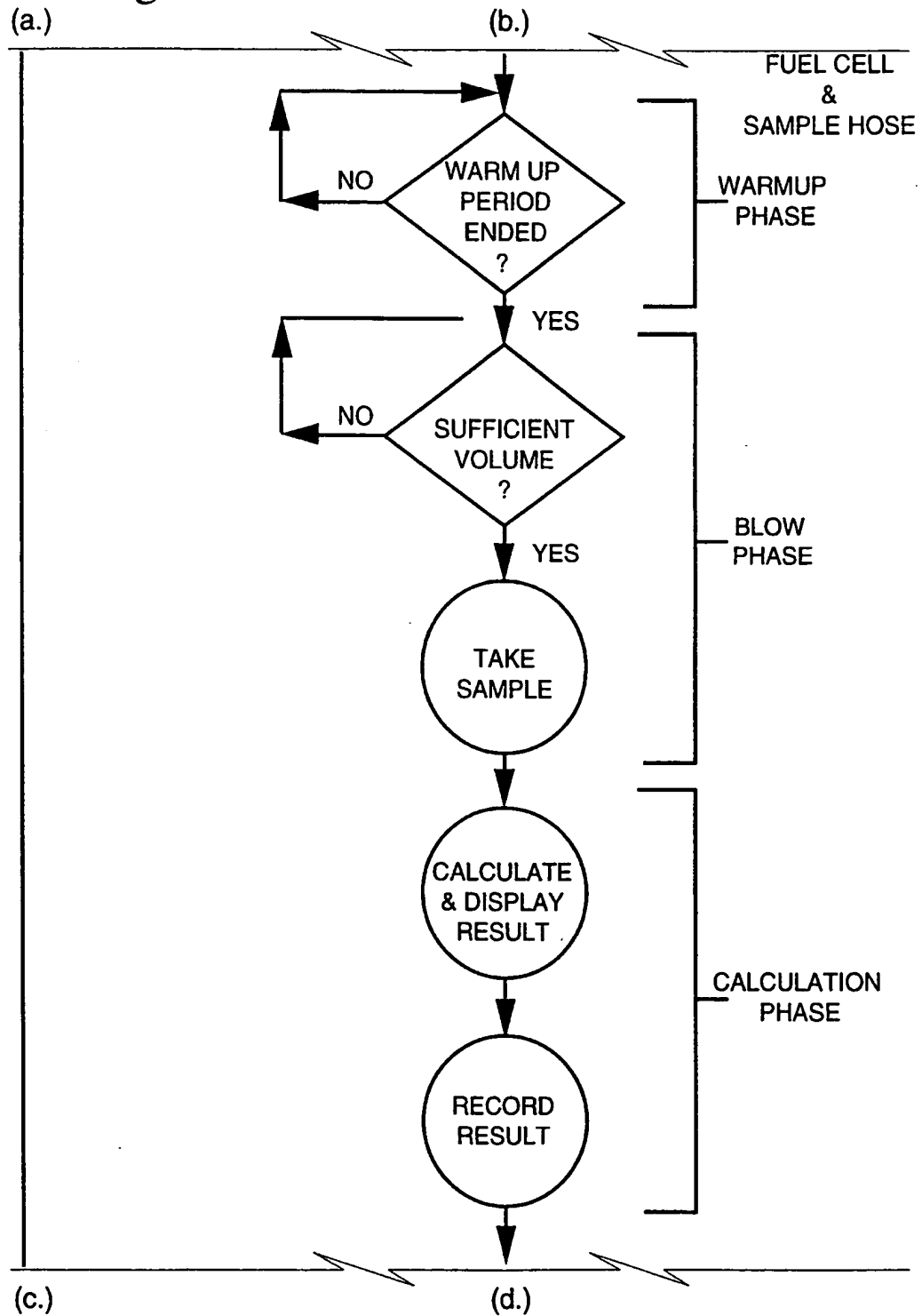
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Fig 1a.



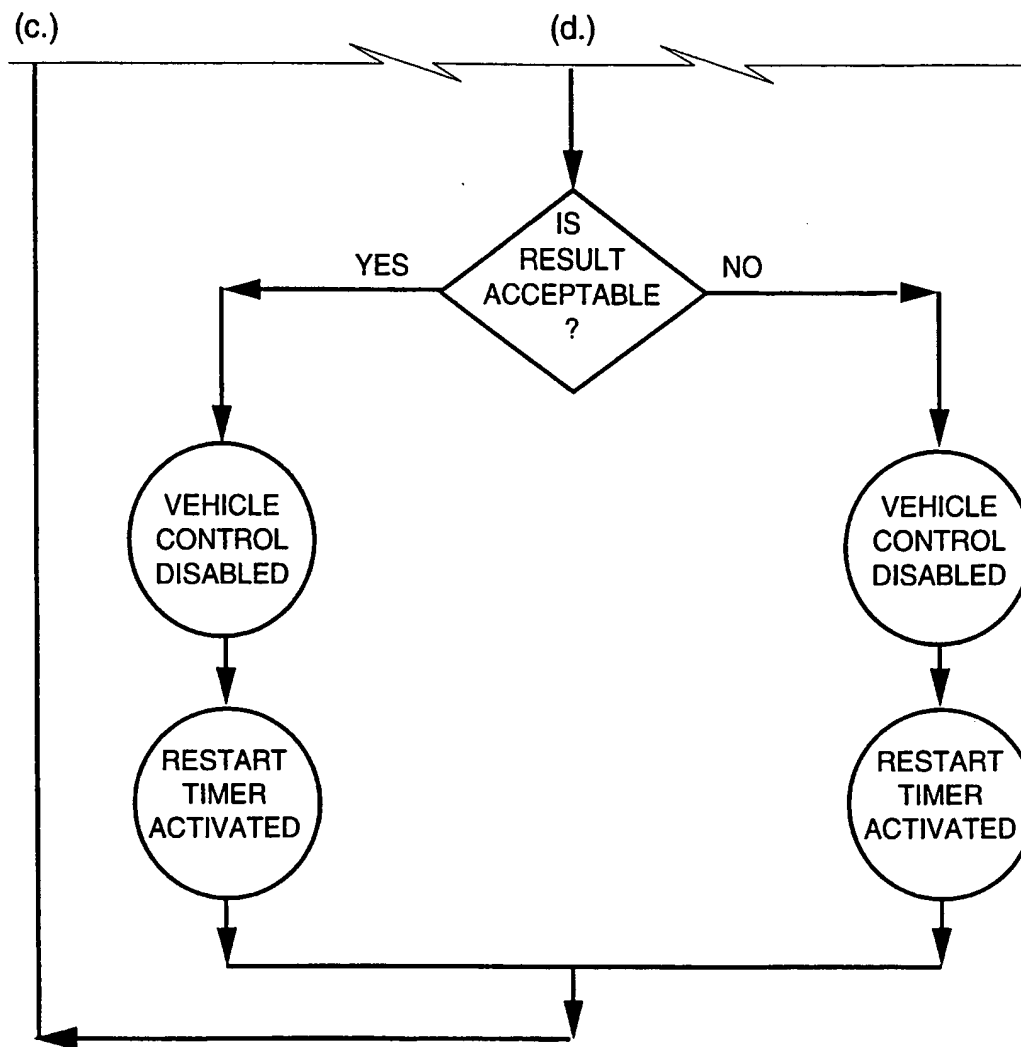
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Fig 1b.



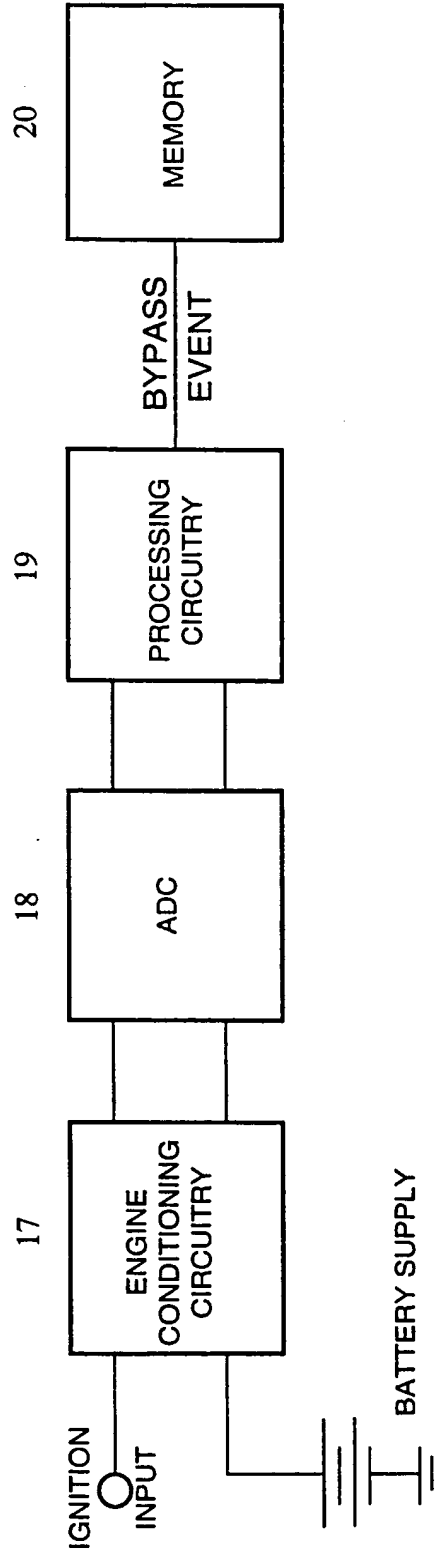
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Fig 1c.



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Fig 3.



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Fig 2.

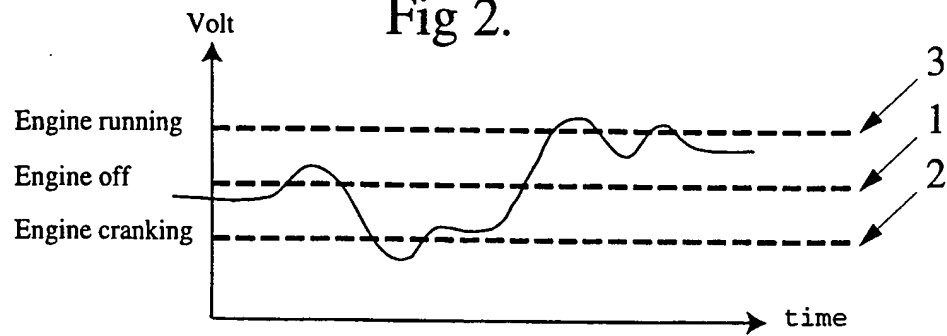
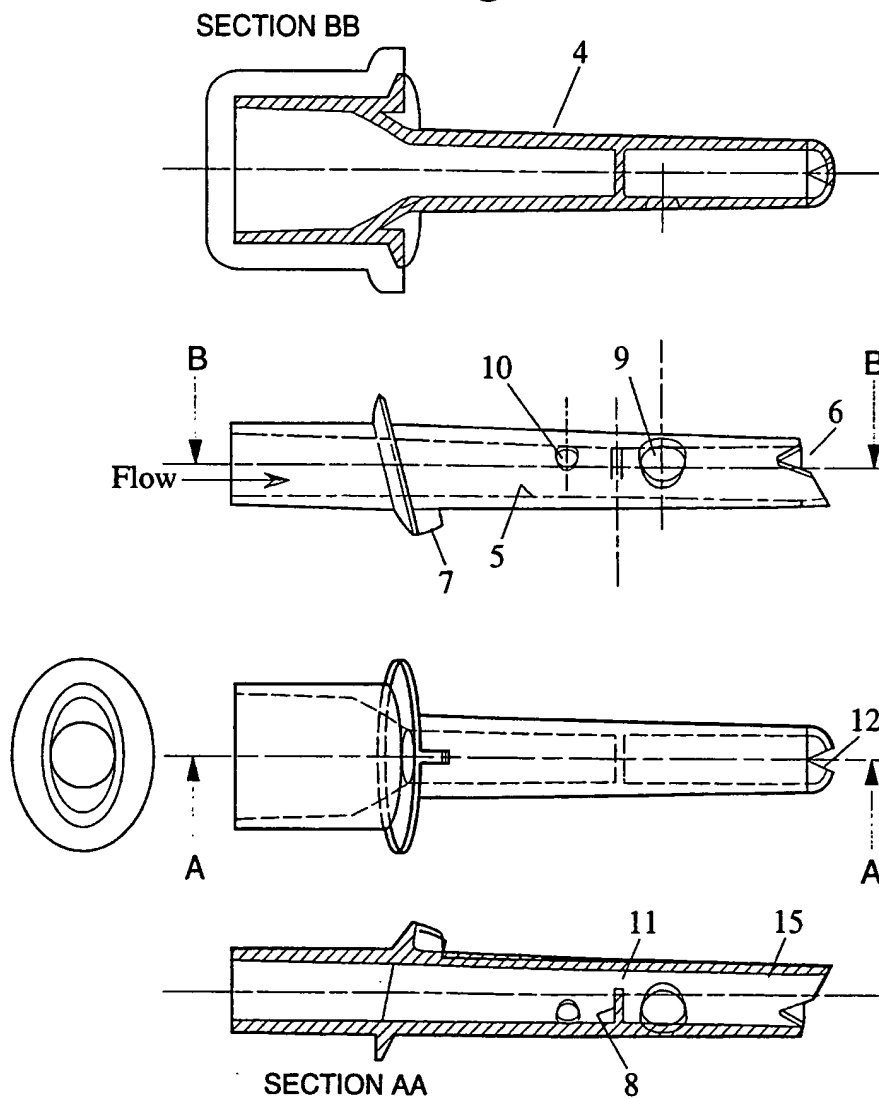


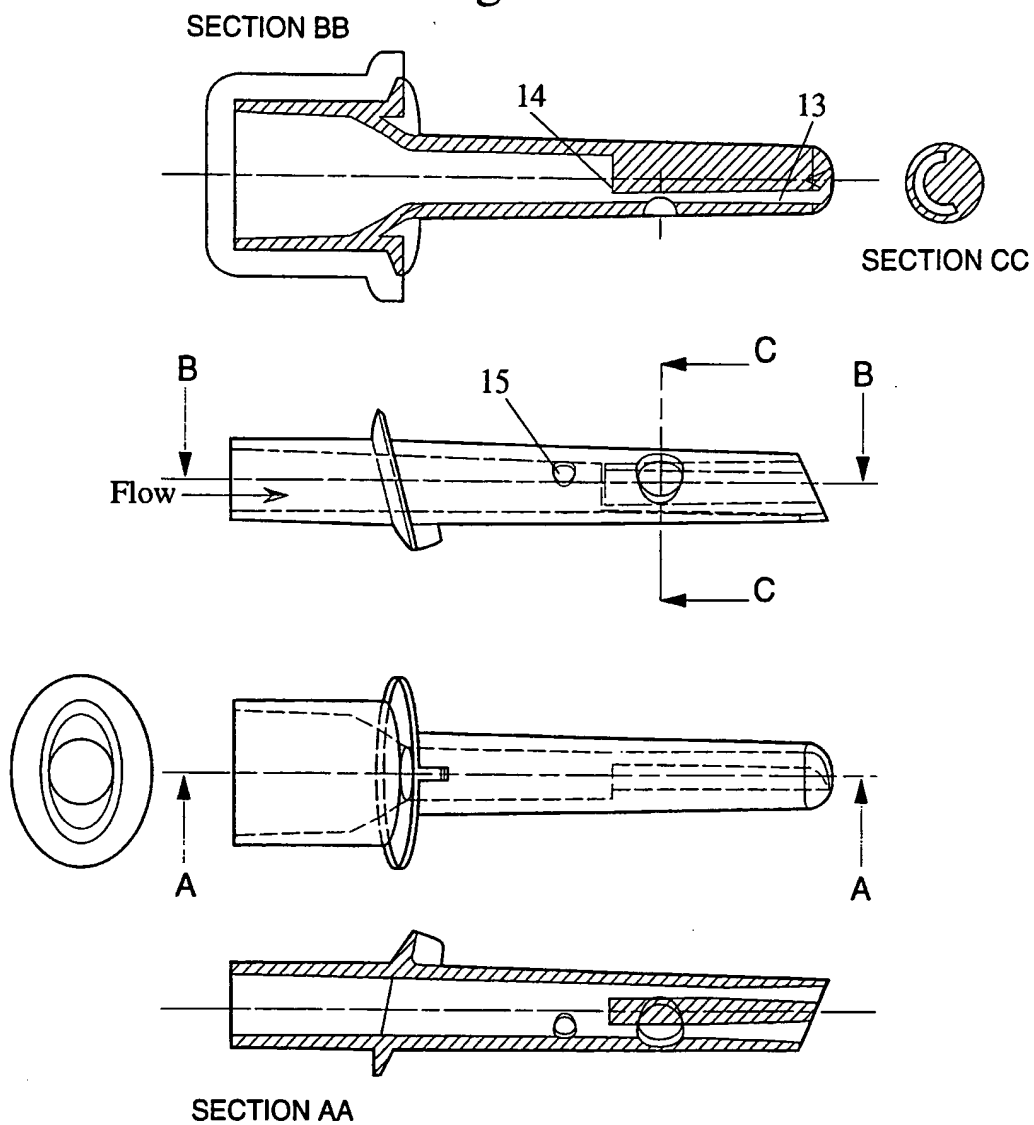
Fig 4.





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Fig 5.



# INTERNATIONAL SEARCH REPORT

International application No.

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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int. Cl. <sup>6</sup> B60K 28/06; B60R 25/04; G01N 33/497; A61B 5/097  According to International Patent Classification (IPC) or to both national classification and IPC				
<b>B. FIELDS SEARCHED</b>  Minimum documentation searched (classification system followed by classification symbols) IPC: B60K 28/06; B60R 25/04; G01N 33/497; A61B 5/097  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above  Electronic data base consulted during the international search (name of data base, and where practicable, search terms used) DERWENT; VOLTAGE (B60K 28/06; B60R 25/04); MOUTHPIECE (G01N 33/497; A61B 5/097)				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>				
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.		
X	AU 10970/88 A (GARREN) 4 August 1988 page 12, line 28-page 16, line 33	1-3		
X	US 5222468 A (KORENAGA) 29 June 1993 column 2, line 13-column 3, line 46	1-3		
X	US 4435649 A (VANDIGRIFF) 6 March 1984 column 2, line 22-column 3, line 29	1-3		
X	GB 2053543 A (LUCAS INDUSTRIES LIMITED) 4 February 1981 page 1, lines 31-101	1-3		
<div style="display: flex; justify-content: space-between;"> <div> <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.         </div> <div> <input checked="" type="checkbox"/> See patent family annex.         </div> </div>				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;">           * Special categories of cited documents :            "A" document defining the general state of the art which is not considered to be of particular relevance            "E" earlier document but published on or after the international filing date            "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)            "O" document referring to an oral disclosure, use, exhibition or other means            "P" document published prior to the international filing date but later than the priority date claimed         </td> <td style="width: 50%; vertical-align: top;">           "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention            "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone            "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art            "&amp;" document member of the same patent family         </td> </tr> </table>			* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family			
Date of the actual completion of the international search 3 July 1995	Date of mailing of the international search report 11 July 1995 (11.07.95)			
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929	Authorized officer  RANGANATH SUBBARAYAN Telephone No. (06) 2832377			

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
P,X	DE 4330733 A1 (VDO ADOLF SCHINDLING AG) 22 December 1994 column 2, line 60-column 3, line 65	1-3
X	Patent Abstracts of Japan, M1260, page 75, JP 4-55180 A (HITACHI LTD) 21 February 1992 abstract	1-3
P,X	Patent Abstracts of Japan, M1677, page 83, JP 6-171465(A) (SUZUKI MOTOR CORP) 21 June 1994 abstract	1-3
X	US 3831141 A (BOWMAN) 20 August 1974 column 5, line 28-column 6, line 33	1-3
X	GB 2263336 A (DRAGERWERK AKTIENGESELLSCHAFT) 21 July 1993 page 4, lines 3-20	4-8
X	US 3608546 A (SHINN) 28 September 1971 column 1, line 67-column 2, line 14	4-7
X	US 3924612 A (DEMPSTER et al.) 9 December 1975 column 2, lines 27-41	4-7
X	FR 2587496 A1 (LION LABORATORIES LIMITED) 20 March 1987 page 2, line 32-page 3, line 10	4-8
X	US 4640293 A (GARBE) 3 February 1987 column 2, line 47-column 3, line 58	4, 5, 7
X	GB 2139389 A (SIMON) 7 November 1984 page 3, line 55-page 4, line 27	4-8
P,X	WO 94/07135 A (LION LABORATORIES PLC) 31 March 1994 page 5, lines 7-26 and page 7, lines 13-19	4-6
X	EP 030675 A (SIEMENS AKTIENGESELLSCHAFT) 24 June 1981 page 2, line 18-page 4, line 26	4-8
X	US 4995400 A (BOEHRINGER et al.) 26 February 1991 column 2, line 46-column 4, line 4	7

## INTERNATIONAL SEARCH REPORT

International application No.

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This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
US	5222468	JP	4325775	JP	4325774		
GB	2053543	DE JP	3026335 56021931	FR	2460814	IT	1132188
GB	2263336	DE	4200830	FR	2686154	US	5321972
US	4640293	DE	3039916	GB	2062470		
GB	2139387	AU FR SE	23984/84 2585082 8400511	CA JP US	1218734 59184032 4592443	DE NL	3403450 8400300
EP	30675	DE	2950970	JP	56097438		
US	4995400	US	4807641				